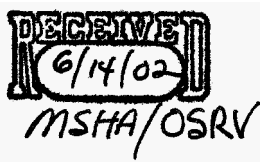
From: TVA Headquarters[tva@vermiculite.org]
Sent: Friday, June 14,2002 11:31 AM
To: comments@msha.gov
Subject: ANPRM - Measuring and Controlling Asbestos Exposure

TVA-Review-of-EPA-report-744-R...



Dear Sir

With reference to the advance notice of proposed rule making relating to measuring and controlling asbestos exposure; The Vermiculite Association, an international body which represents the United States vermiculite industry, wish to submit the attached report (TVA-Review-of-EPA-report-744-R-OO-OI O.pdf) for your consideration.

Following publication of EPA report 744-R-00-010 entitled "Sampling and Analysis of Consumer Garden Products That Contain Vermiculite", this Association commissioned Dr. Eric J. Chatfield, a renowned expert in the analysis and testing of asbestos, to review the work carried out by the EPA and its contractors.

The conclusions of his review were that;
"With the exception of experiments performed using samples of Zonolite from Libby, Montana, the results of these EPA studies provide no scientific basis for the statement that currently available vermiculite products contain asbestos, or that use of these products present measurable cancer risks."

This confirms our long held views that current production of vermiculite is a safe product to use, it is not asbestos, and should not be related to it. It also confirms the well known fact that the Libby, Montana, deposit was unique amongst American deposits, and should not be linked to current production.

The work of the EPA and our subsequent review also confirms that;
1) the identification and measurement of asbestos fibers is extremely difficult.
2) incorrect characterization leads to erroneous conclusions.

We hope the above will be taken into account in any future rule making.

Yours sincerely

Dr. Michael J. Allen
for The Vermiculite Association

AB24 - Comm - 11

CHATFIELD | **TECHNICAL CONSULTING LIMITED**

2071 Dickson Road
Mississauga, Ontario
CANADA L5B 1Y8
Telephone: (905) 896-7611
Fax: (905) 896-1930

REVIEW OF:

SAMPLING AND ANALYSIS OF CONSUMER GARDEN PRODUCTS THAT CONTAIN VERMICULITE

EPA 744-R-00-010, AUGUST, 2000

Presented At:

THE VERMICULITE ASSOCIATION
Vermiculite Conference 2001

15th November 2001

By

Dr. Eric J. Chatfield

1. INTRODUCTION

In August 2000, the Office of Prevention, Pesticides and Toxic Substances of the USEPA published Report EPA 744-R-00-010 entitled:

> "Sampling and Analysis of Consumer Garden Products
> That Contain Vermiculite"

The report consists of two parts: a study by EPA Region 10 in Seattle, Washington, dated July 26,2000; and, a study by Versar, Inc., under contract with USEPA Headquarters in Washington, D.C., dated August 22,2000. The organization of the two studies is shown in Figure 1.

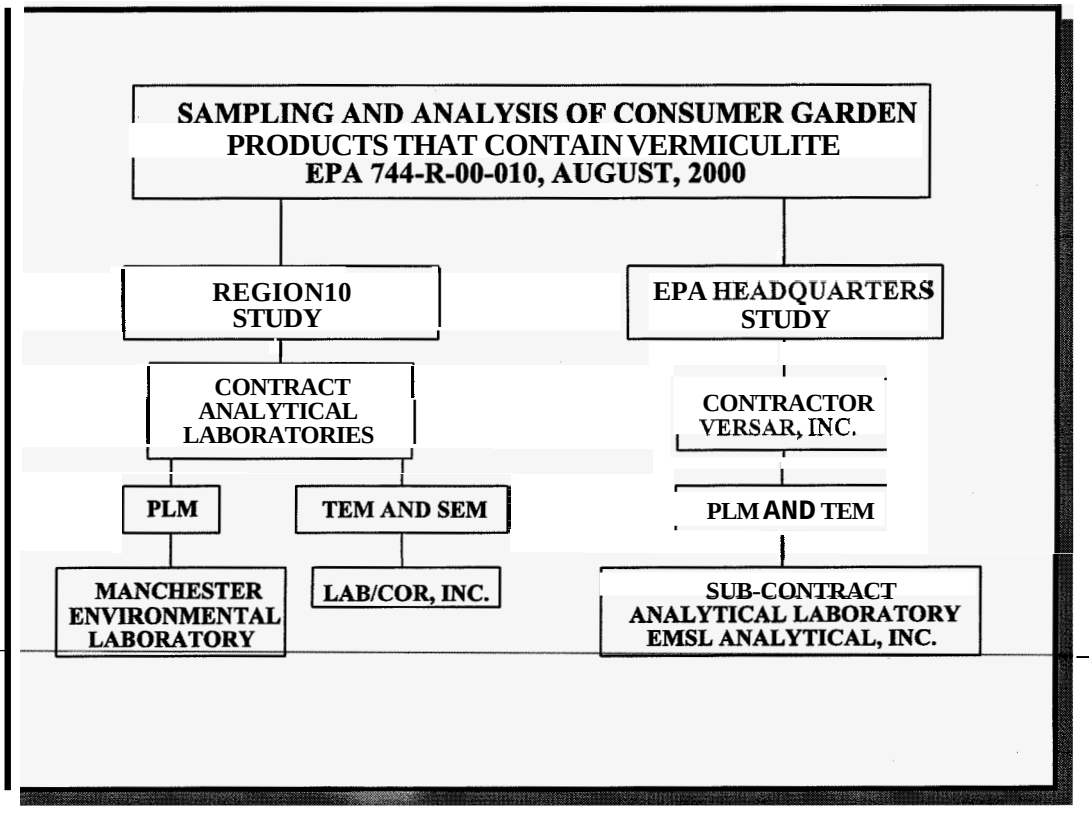


Figure 1. Organization of Studies on Consumer Garden Products

2. EPA REGION 10 INVESTIGATION OF ASBESTOS IN VERMICULITE

2.1 Conclusions and Recommendations by EPA Region 10

EPA Region 10 reached a number of conclusions from the results of their study, and made recommendations. Their conclusions are shown in Figure 2, and their

recommendations are shown in Figure **3.**

1. Five vermiculite products tested contained asbestos.
2. One asbestos-contaminated vermiculite tested (Zonolite) released airborne asbestos fibers when subjected to simulated use.
3. Consumers have no way of knowing which vermiculite products are contaminated with asbestos and which are not.
4. Analysis of asbestos-contaminated vermiculite products revealed a wide degree of variability in the amount and types of asbestos present in the samples. The variability of analytical results demonstrates a need for additional statistically based studies using more sensitive sampling and analytical methods.

Figure 2. Conclusions in the EPA Region 10 Study

1. EPA Region 10 advised consumers not to use Zonolite Chemical Packaging Vermiculite until further statistically based testing could be performed.
2. EPA Region 10 also advised consumers to follow three basic precautions when working with products that contain vermiculite in order to reduce potential exposure to asbestos:

   (a) use vermiculite outdoors;
   (b) keep vermiculite damp to avoid generating dust;
   (c) avoid bringing dust from clothing into the home.

Figure 3. Recommendations Made in the EPA Region 10 Study

2.2 Analyses of Bulk Samples of Vermiculite Products

Routine polarized light microscopy (PLM) analyses were performed by Manchester Environmental Laboratory, and transmission electron microscopy (TEM) analyses were performed by Lab/Cor, Inc.

The routine PLM measurements conducted by Manchester Environmental Laboratory generally showed **either no asbestos-forming amphiboles, or a trace of amphibole which was not quantified.** Tremolite, actinolite and anthophyllite were the species reported, but in no case was there any specification in the analytical reports as to whether the amphibole species detected were asbestiform or non-asbestiform.

A major limitation of the scope of the Lab/Cor, Inc. analyses of the vermiculite samples, clearly stated in each report, is shown in Figure 4. Statement 1, in Figure 4, clearly specifies that the applicability of the analytical method used was limited to determination of **purified regulated asbestiform minerals** as they are normally

1. "The scope of this analysis is to differentiate purified regulated asbestiform minerals that have been added to bulk building materials. Samples such as soils, sediments or raw ores may require further mineralogical analysis to differentiate mineral species."

2. "Interpretation of these results is the sole responsibility of the client."

Figure 4. Limitations of Scope for Lab/Cor, Inc. Vermiculite Analyses by TEM

encountered in building materials. Further disclaimers stated by Lab/Cor, Inc. for these bulk analyses by TEM are shown in Figure 5. Essentially, this means that any fiber with a minimum aspect ratio of 5:1 and with appropriate chemical composition has been reported as asbestos, even if only cleavage fragments were present.

1. "Fibers of any length with an aspect ratio of at least 5:1 and proper chemistry were counted as asbestiform regulated mineral types."

2. "Cleavage fragments may be identified as asbestiform regulated mineral fibers in this analysis."

Figure 5. Disclaimer Forming Part of Lab/Core, Inc. Bulk Analysis Reports

The TEM analyses by Lab/Cor, Inc. were made using very small sub-samples of only a few milligrams. The sub-samples were ashed, and extracted with hydrochloric

acid. TEM specimens were then prepared from the residue from these treatments, and a visual estimate of the proportion of "asbestos" on these TEM specimens was made. When detected, the percentage of asbestos reported in the sub-sample was usually 1% of the residue from ashing and acid extraction. It is **extremely** unlikely that, in vermiculite from geographically widespread locations, "asbestos" would be present at a constant concentration of 1% in the residue remaining after ashing and acid treatment. The cover sheet for each set of analyses clearly expresses the limitations of the analyses, but the EPA investigators disregarded these limitations. In particular, although the laboratory reports indicate that cleavage fragments may be identified as asbestiform regulated mineral fibers in these analyses, no mention of this important qualification of the analyses is made by the EPA investigators in their conclusions.

The results of these vermiculite bulk analyses cannot be interpreted, because no record was made of the dimensions of the fibers detected; the only record made was a "visual estimate" of the proportion of "asbestos" on the TEM specimens.

The analytical deficiencies in the Lab/Cor, Inc. TEM analyses of the bulk samples are shown in Figure ***6***.

1. The disclaimer claims an accuracy of ±5%, which is unrealistically optimistic.
2. Starting weights of 1 - 5 mg are too small for reliable analysis of vermiculite samples.
3. Visual estimates of fibrous materials in the vicinity of 10% and lower are **very** unreliable. Visual estimates close to 1% may be **a factor of 10 or more in error** (0.1% to 10%).
4. Visual estimates of "asbestiform regulated minerals" made by Lab/Cor may include cleavage fragments and common unregulated amphiboles such as hornblende.

Figure 6. Deficiencies in Lab/Cor, Inc. TEM Analyses of Bulk Vermiculite Samples

2.3 Simulation Studies

On the basis of their TEM analyses of the bulk samples, Lab/Cor, Inc. reported that Coles Cactus Mix and a sample of Zonolite (which had originated from Libby,

Montana, and is no longer available) contained asbestos. These vermiculite samples were selected for the air sampling phase of the EPA Region 10 study.

Simulation studies were conducted in a glove box at Manchester Environmental Laboratory. The studies consisted of pouring vermiculite-containing potting soil into a tray, filling several pots, and then emptying the pots. **No airborne asbestos was detected in the simulation studies using Coles Cactus Mix.** The air samples collected in the simulation using Libby Zonolite were overloaded, and EPA requested that indirect-transfer TEM specimen preparation be used to evaluate these samples. After it was found that airborne asbestos was detected **only** in the Zonolite samples, all subsequent simulation studies were conducted using a mixture of the Libby Zonolite and peat moss.

2.4 Chronology of the EPA Region 10 Study

The chronology of events is summarized in Figures 7 and **8.** The information was compiled from entries in the EPA project notebooks and from the Lab/Cor, Inc. reports.

2000 Jan 27	Jed Januch assigned to assist Keven McDermott with the vermiculite project		
2000 Jan 31	Samples of vermiculite products collected from various suppliers		
2000 Feb 03	Samples delivered to Lab/Cor		
2000 Feb 11	Results received from Lab/Cor. The following are positive for asbestos:		
	54205	Zonolite	Actinolite 0.56%
	54206	Zonolite	Actinolite 0.47%
	54214	Coles Cactus Mix	Actinolite 0.45%
2000 Feb **12**	Telephone discussion with Andrew Schneider of the Seattle Post-Intelligencer		
2000 Feb 14	Discussed TEM analytical methods with Lab/Cor. Lab/Cor did not recommend NIOSH 7402 because it counts only fibers longer than 5 µm. Recommended EPA draft method (Yamate) Level 2. Lab/Cor stated that actinolite is similar to tremolite - substitutes Fe for calcium. Checked internet to find TEM analytical methods for asbestos.		

Figure 7. Chronology of EPA Region 10 Study, 2000 Jan 27 - 2000 Feb 14

2000 Feb 14	Discussion with Janine Reese on label requirements. No requirement for label if < 1%. "Might be good to look at potential worker exposure"
2000 Feb 15	Commenced air sampling studies at Manchester Lab. using Coles Cactus Mix and Libby Zonolite sample. Emptied bag of soil into tub, filled 10 pots every 2-3 minutes, emptied pots back into tub, cleaned work surfaces using whisk and dust pan.
2000 Feb 17	Submitted air samples to Lab/Cor for analysis.
2000 Feb 22	Air sample analyses completed No airborne asbestos detected using Coles Cactus Mix. Air filters using Libby Zonolite overloaded.
2000 Mar 07	Fines from sieving of 4 vermiculite samples given to Susan Davis, Manchester Environmental Laboratory. Also submitted 3 dust samples from a vermiculite expansion plant in Portland, Oregon.
2000 Mar 07	Commenced air sampling studies using 50/50 mix of peat moss and Zonolite
2000 Mar 08	Tests on packing jars in Zonolite
2000 Apr 11	Tests on sample packing using Zonolite
2000 Apr 13	Tests on sample packing using Zonolite
2000 May 04	Called Lab/Cor to ask whether EPA's vermiculite samples may contain richterite or winchite
2000 May 05	Called Lab/Cor to ask for discount for EPA. 91 samples to date at a charge of $6,700. ($73.63 per sample)
2000 May 11	John Harris of Lab/Cor. Fibrous material identified only as tremolite or actinolite. No richterite. "Calcium substitution was seen, also Fe. That's why they do diffraction".
2000 May 24	Viewed photos of vermiculite samples. Checked over data and discussed classification of amphiboles, richterite vs actinolite/tremolite.
2000 May 26	Visit to Lab/Cor with Bruce Woods and Daniel Frank(?) - checked out data. "Compared spectra of tremolite, actinolite and richterite - we are okay!"

Figure 8. Chronology of EPA Region 10 Study, 2000 Feb 14 - 2000 May 26

In Figure **8,** it is recorded that on March 07, dust samples from a vermiculite expansion plant in Portland, Oregon were submitted to Manchester Environmental Laboratory. There is no mention in the EPA Region 10 report that such samples had been collected or analyzed, and no results of these sample analyses were quoted in the EPA Region 10 report.

The EPA personnel assigned to conduct this study were inexperienced in investigations relating to asbestos in mineral products. The project notebooks reveal that the investigators had little knowledge about the analytical methods and their limitations. The inexperience of the laboratory is shown by the entry for 2000 May 11 in Figure **8;** it is not possible to discriminate between individual monoclinic amphiboles by electron diffraction, and there appears to be considerable misunderstanding about the chemistry of the various amphiboles under discussion.

2.5 Overall Comments on EPA Region 10 Study

Figure 9 summarizes comments with respect to the EPA Region 10 study. **The EPA Region 10 study did not detect emissions of asbestos fibers from materials derived from current sources of vermiculite.** The only sample that yielded airborne asbestos fibers during the simulation studies was a sample of Zonolite originating from Libby, Montana. The Libby mine was closed in 1990, and vermiculite from this source is no longer produced.

The EPA Region 10 study apparently did not attempt to discriminate between non-asbestiform cleavage fragments and asbestos fibers. The importance of this discrimination is illustrated by Figures 10-13**,** which show photographs and polarized light photo-micrographs of non-asbestiform tremolite, compared with the asbestiform amphibole found in vermiculite from Libby, Montana.

Therefore, there is no scientific basis for the conclusions published in the EPA Region 10 study. In particular, the analytical methods used to determine asbestos in bulk samples of vermiculite were inappropriate, and EPA Region 10 overlooked the laboratory's disclaimers regarding the scope of the analyses.

In the EPA Region 10 study:

1. No asbestos fibers were detected in any of the simulation studies except in the case of a discontinued sample of Zonolite vermiculite from Libby

2. After this observation was made, all succeeding simulation studies were conducted using either Zonolite, or Zonolite mixed with peat moss

3. **EPA** Region 10 conclusions do not correctly represent the situation with current sources of vermiculite

Figure 9. Summary of EPA Region 10 Simulation Studies

Figure 10. Non-Asbestiform Tremolite, Sparta, New Jersey

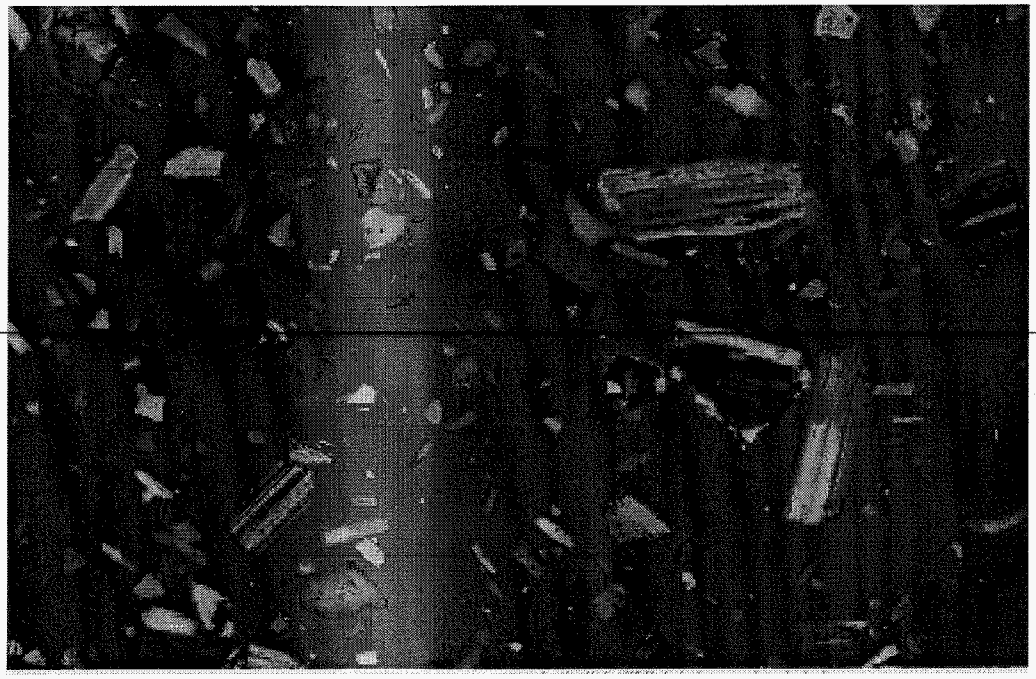


Figure 11. PLM Micrograph of Crushed Non-Asbestiform Tremolite From Sparta, New Jersey

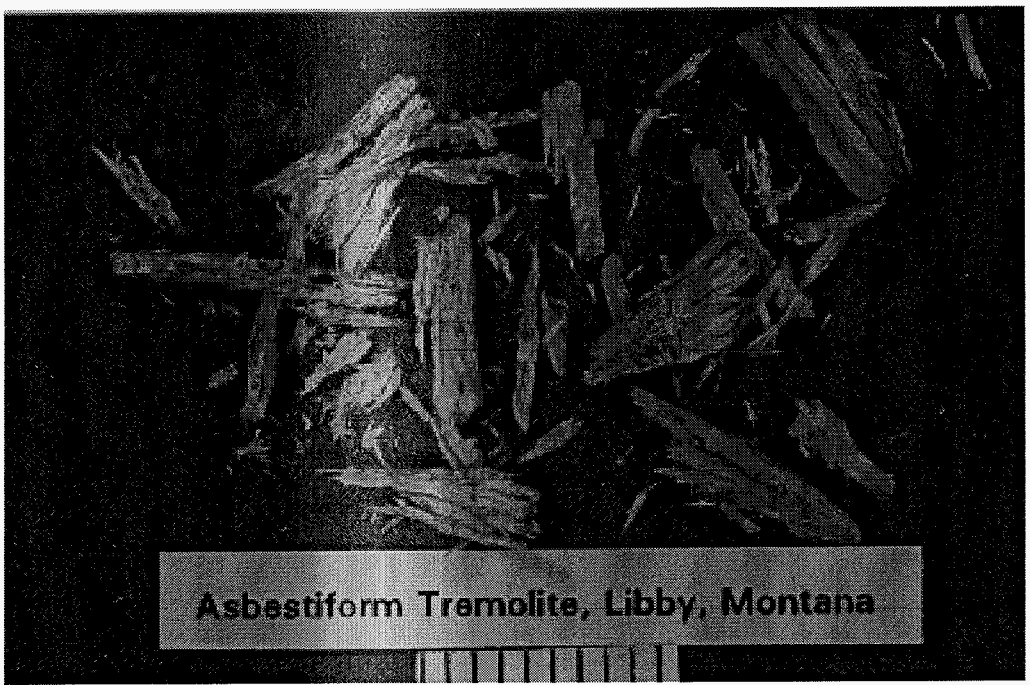


Figure 12. Asbestos Fiber Bundles Picked From Libby Vermiculite (Formerly Called Tremolite, Now Called Richterite)

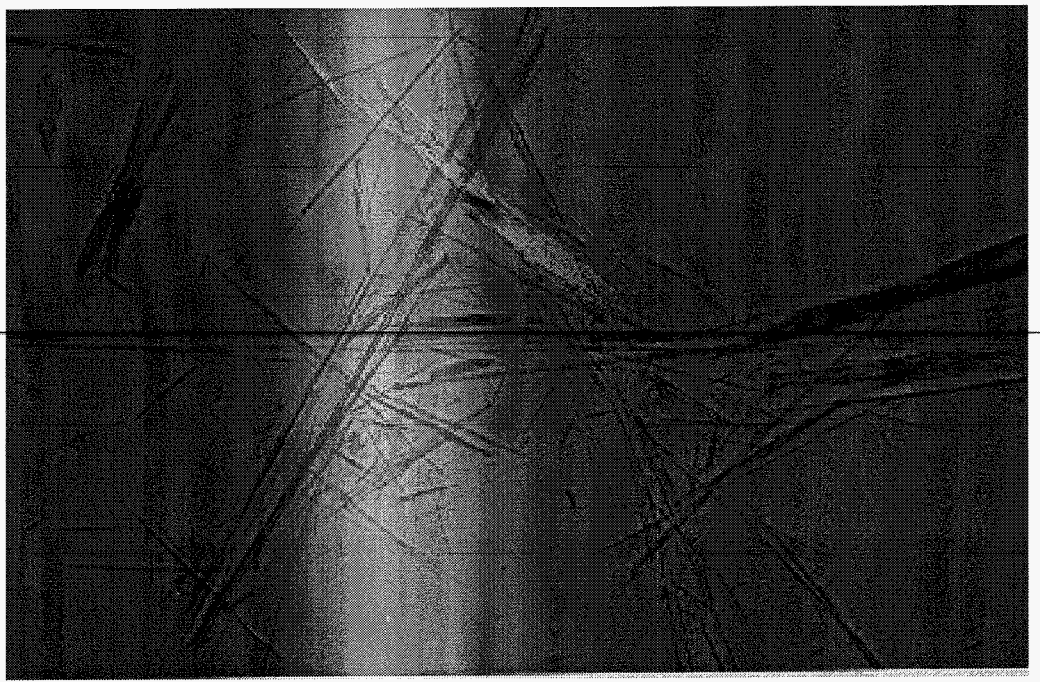


Figure 13. PLM Micrograph of Asbestos Fiber Bundles From Libby Vermiculite

3. EPA HEADQUARTERS STUDY: SAMPLING AND ANALYSIS OF CONSUMER PRODUCTS THAT CONTAIN VERMICULITE

EPA Headquarters contracted their study to Versar, Inc. Versar sub-contracted all analytical work to EMSL Analytical, Inc.

3.1 Conclusions in the EPA Headquarters Study

Figure 14 shows the conclusions published in the EPA Headquarters study.

1. Some of the consumer products tested contain small amounts of asbestos.
2. The asbestos content of the products appears to be very close to the detection limit for TEM.
3. Based on the results of the consumer simulation, it appears that the relationship between bulk sample results (i.e., percent asbestos) and indoor air concentrations during use, is not easily quantifiable.
4. For consumers engaging in indoor gardening activities with vermiculite products 4 hours per day, once a year for 30 years, the estimated lifetime cancer risks range from 1 in 320,000 (Kellogg's) to 1 in 36,000 (Zonolite).
5. For consumers who garden with vermiculite for one-half hour per year for 10 years, the estimated lifetime cancer risks ranged from 1 in 7.7 million (Kellogg's) to 1 in 830,000 (Zonolite).
6. If consumer exposures/frequencies/durations are 10 to 100 times higher than those assumed here, the corresponding risks to consumers would also be 10 to 100 times higher. Occupational exposures were not evaluated as part of this study.

Figure 14. Conclusions in the EPA Headquarters Study

3.2 Analyses of Bulk Samples of Vermiculite Products

With the exception of the analyses of the Libby Zonolite samples, the analyses of the bulk samples show that the fibers identified as asbestos are actually cleavage fragments. For samples other than the Zonolite, a total of only 22 fibers longer than 5 μm were detected, and these had a mean aspect ratio of 9.43. Approximately 91% of these fibers had aspect ratios lower than 20:1. The dimensions of these fibers are shown in Figure 15.

Fiber	Fiber Length	Fiber Width	Aspect Ratio
1	6.00	0.75	8.00
2	12.00	1.00	12.00
3	6.00	1.00	6.00
4	24.00	2.00	12.00
5	6.00	0.75	8.00
6	18.00	2.00	9.00
7	17.00	2.00	8.50
8	10.00	2.00	5.00
9	17.00	2.00	8.50
10	11.00	2.00	5.50
11	18.00	2.50	7.20
12	6.50	0.50	13.00
13	6.00	0.50	12.00
14	17.00	0.75	22.67
15	19.00	1.00	19.00
16	10.00	2.00	5.00
17	15.00	0.50	30.00
18	10.00	2.50	4.00
19	7.00	0.75	9.33
20	6.00	1.50	4.00
21	5.50	0.75	7.33
22	9.00	0.75	12.00

Figure 15. EPA Headquarters Study, Fibers Longer than 5 μm in Bulk Samples

EPA disregarded its own definition of asbestos in referring to these fibers as "asbestos". Figure 16 shows a comparison of the data on fiber sizes found in the EPA Headquarters study and the definition of asbestos published in EPA/600/R-93/116, Test Method for the Determination of Asbestos in Bulk Building Materials.

In the EPA Headquarters study, EPA ignored its own definition of asbestos:

1. **A** total **of 22** fibers longer than ***5*** μm were detected in the entire **EPA** Headquarters study; these fibers had a mean aspect ratio of 9.43

   Compare with the **EPA** definition of asbestos:

   With the light microscope, the asbestiform habit is generally recognized by the following characteristics:

   - Mean aspect ratios ranging from 20:1 to 100:1 or higher for fibers longer than ***5*** μm

2. In the **EPA** Headquarters study, **90.9%** of fibers longer than ***5*** μm had aspect ratios less than **20:1**

   Compare with the EPA definition of asbestos:

   ...it is unlikely that the asbestos component would be dominated by particles (individual fibers) having aspect ratios of <20:1 for fibers longer than 5 μm.

   If a sample contains a fibrous component of which most of the fibers have aspect ratios of <20:1 and that do not display the additional asbestiform characteristics, **by** definition the component should not be considered asbestos.

Figure 16. Comparison of Fiber Size Data With **EPA** Definition of Asbestos

No more than 4 amphibole fibers were reported in any individual bulk sample analysis; each of the numerical "asbestos" concentrations reported is based on only 1 to 4 fibers. Furthermore, the analytical laboratory mis-identified a number of fibers, classifying fibers as actinolitehichterite when their x-ray spectra clearly show that these fibers were either hornblende or diopside. Figure 17 shows the products for which numerical values for the "asbestos" concentrations were reported.

Sample	Sample Number	Fibers and Dimensions (µm)	Reported % Asbestos
Ace Horticultural Vermiculite Miami	90813	6 x 0.75, 12 x 1, 6 x 1, 24 x 2	**0.35**
	68184	6 x 0.5	BQL
Hoffman's Vermiculite	90831	18 x 2, 17 x 2, 4 x 2, 10 x 2	0.7
	68185	17 x 0.75	BQL
Ace Horticultural Vermiculite Hopkins, Minnesota	90832	17 x 2	0.24
	68186	19 x 1	BQL
Earthgro's Best Vermiculite Hopkins, Minnesota	90833	11 x 2, 18 x 2.5	0.41
	68187	10 x 2 (Diopside)	0.17
Schultz Horticultural Vermiculite Springfield, Virginia	90844	DATA WITHHELD	0.13
	68188		ND
VWR Packaging Vermiculite	68180	10 x 2.5	0.14

Figure 17. EPA Headquarters Study, Bulk Vermiculite Analyses by TEM

As can be seen in Figure 17, the reported numerical "asbestos" concentrations are often based on only one or two fibers, and both the widths and the aspect ratios of these fibers are strong indicators that they are cleavage fragments. It should be noted that the single fiber reported in Earthgro'sBest Vermiculite, Sample 68187, was mis-identified as actinolitehichteritewhen it was actually diopside. Figure 18 shows the energy dispersive x-ray (EDXA) spectrum reported for a correctly identified fiber of actinolite. Figure 19 shows the EDXA spectrum reported for the fiber in Sample 68187, in which the calcium peak is approximately double the size of that shown in Figure 18. The spectrum in Figure 19 corresponds to diopside, not actinolitehichteriteas erroneously stated at the top of the figure.

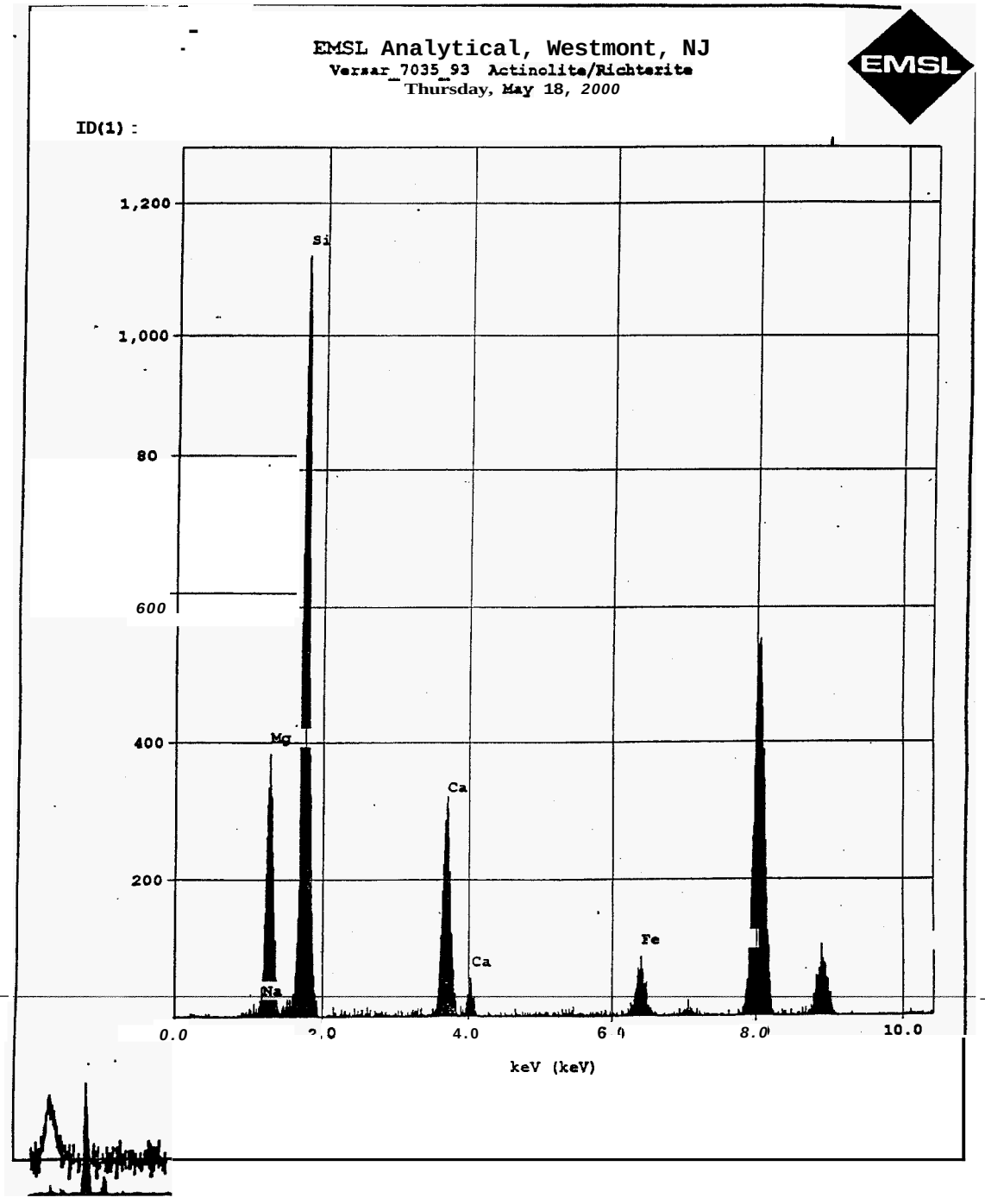


Figure 18. Energy Dispersive X-Ray Spectrum Correctly Reported as Actinolite

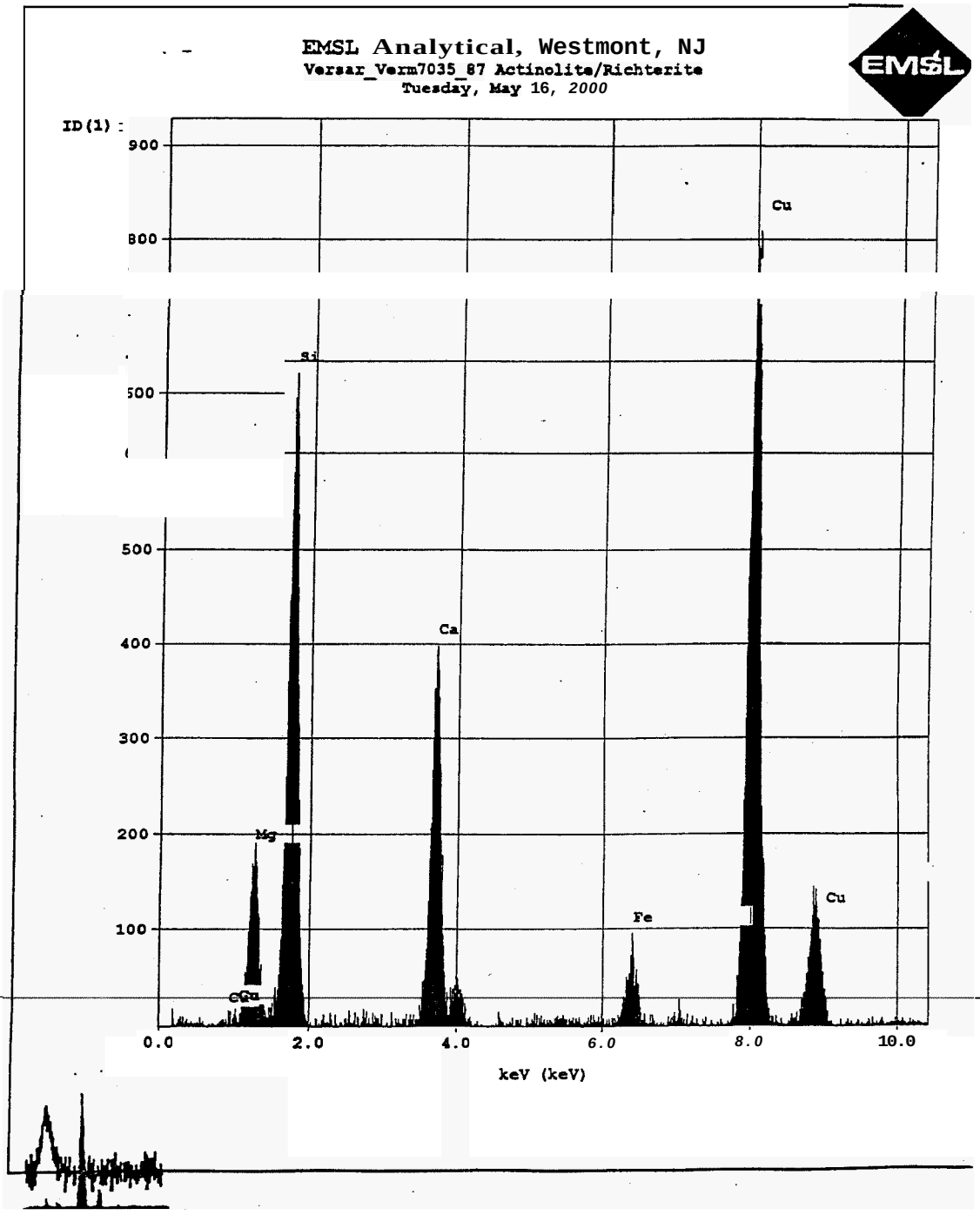


Figure 19. Energy Dispersive X-Ray Spectrum From Diopside Fiber Misidentified as Actinolite/Richterite

Figure 21 shows the results of product analyses for which the reported concentrations were either "BQL" (below quantification limit), or "ND" (none detected). Fibers were also mis-identified in this group of samples. If these misidentifications are accounted for, the results for three of these samples would change from "BQL" to "ND".

Sample	Sample Number	Fibers and Dimensions (μm)	Reported % Asbestos
Hoffman's African Violet Soil Mix	90836	2.5 x 0.25, 3.5 x 0.25, 11 x 2 (Diopside)	BQL
	68193	3 x 0.5, 4 x 0.5	BQL
Scotts Vermiculite	90839		ND
	68192	15 x 0.5	BQL
Schultz Horicultural Vermiculite	90816	5 x 1 (Hornblende)	BQL
	68189		ND
Whitney Farms Vermiculite	90819	3.5 x 1 (Diopside)	BQL
Whitney Farms African Violet Mix	90820	3 x 0.5 (Probable Hornblende)	BQL
	68191		ND
Black Gold Vermiculite	90821	2 x 0.25 (Chrysotile)	BQL
	68190		ND
Schundler Horticultural Vermiculite	90842	4 x 0.1 (Chrysotile)	BQL
Care Free Jiffy Mix	90843	3 x 0.25 (Chrysotile), 6.5 x 0.5 (Actinolite)	BQL

Figure 20. EPA Headquarters Study, Bulk Sample Analyses by TEM

Figures 21, 22 and 23 show examples of the EXDA spectra for which the fibers were identified as actinolite/richterite or actinolite, when in fact they were diopside or hornblende, neither of which is chemically consistent with any regulated asbestos species.

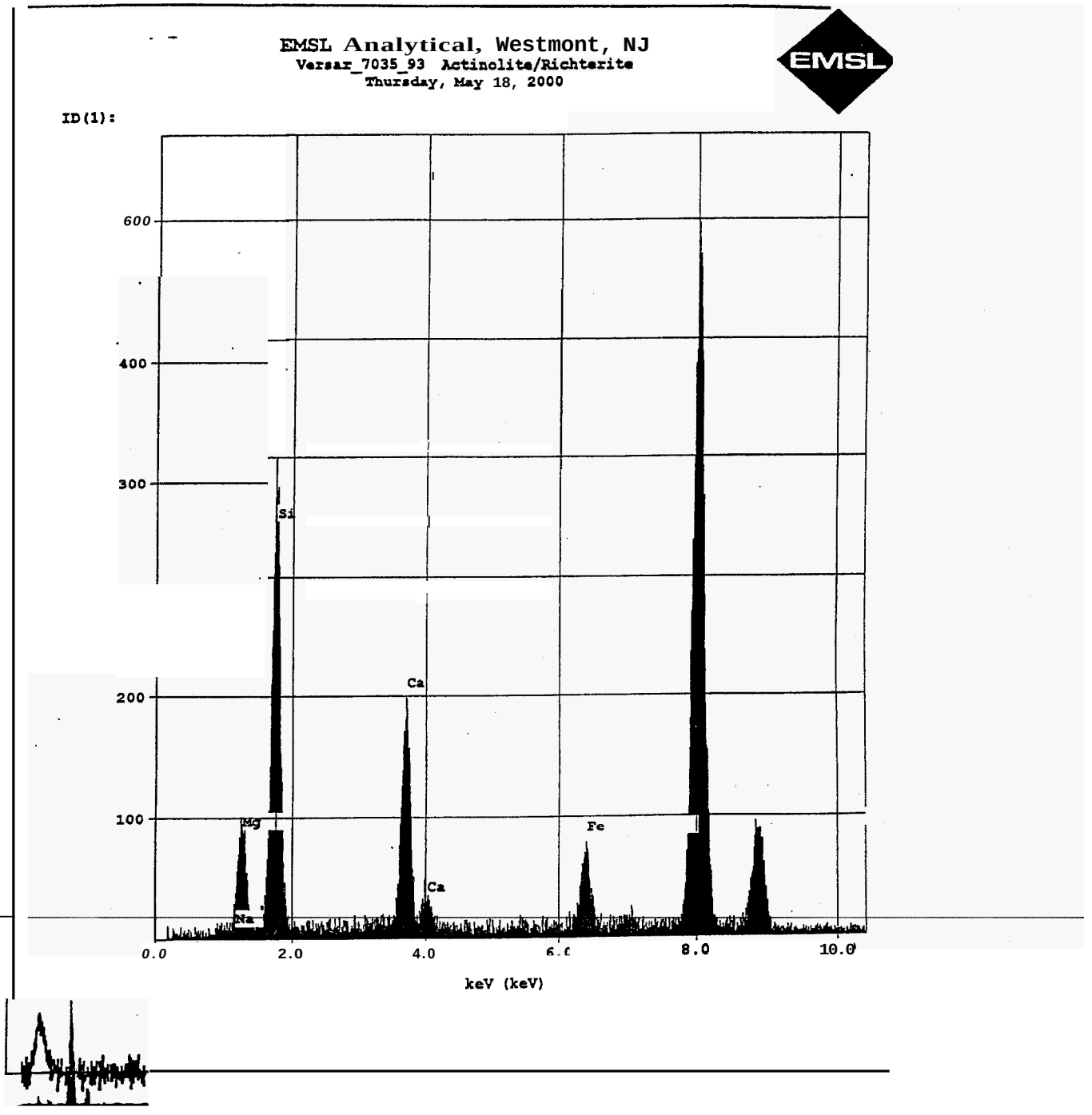


Figure 21. Energy Dispersive X-Ray Spectrum From Diopside Fiber Mis-identified as Actinolite/Richterite

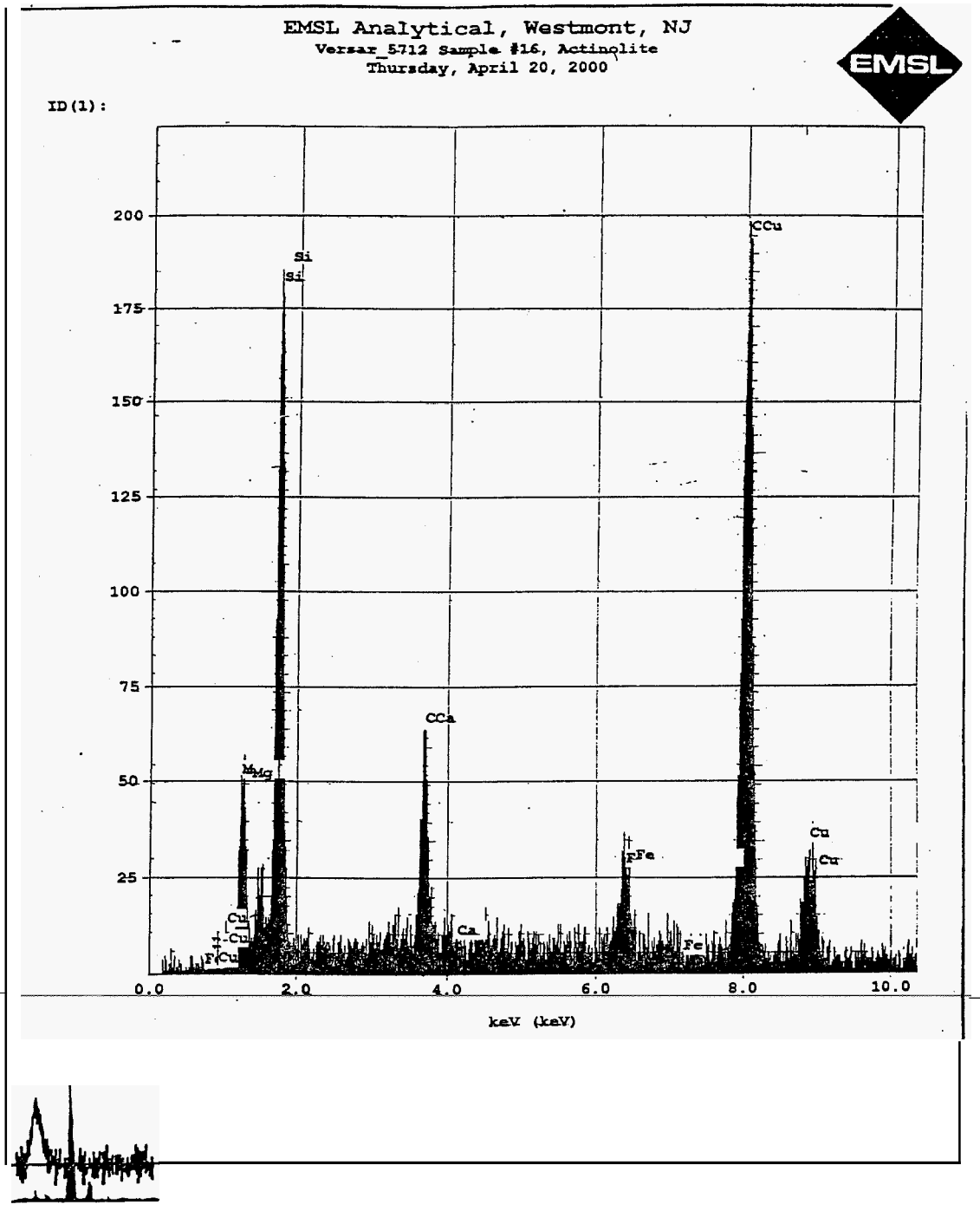


Figure 22. Energy Dispersive X-Ray Spectrum From Hornblende Fiber Mis-identified as Actinolite

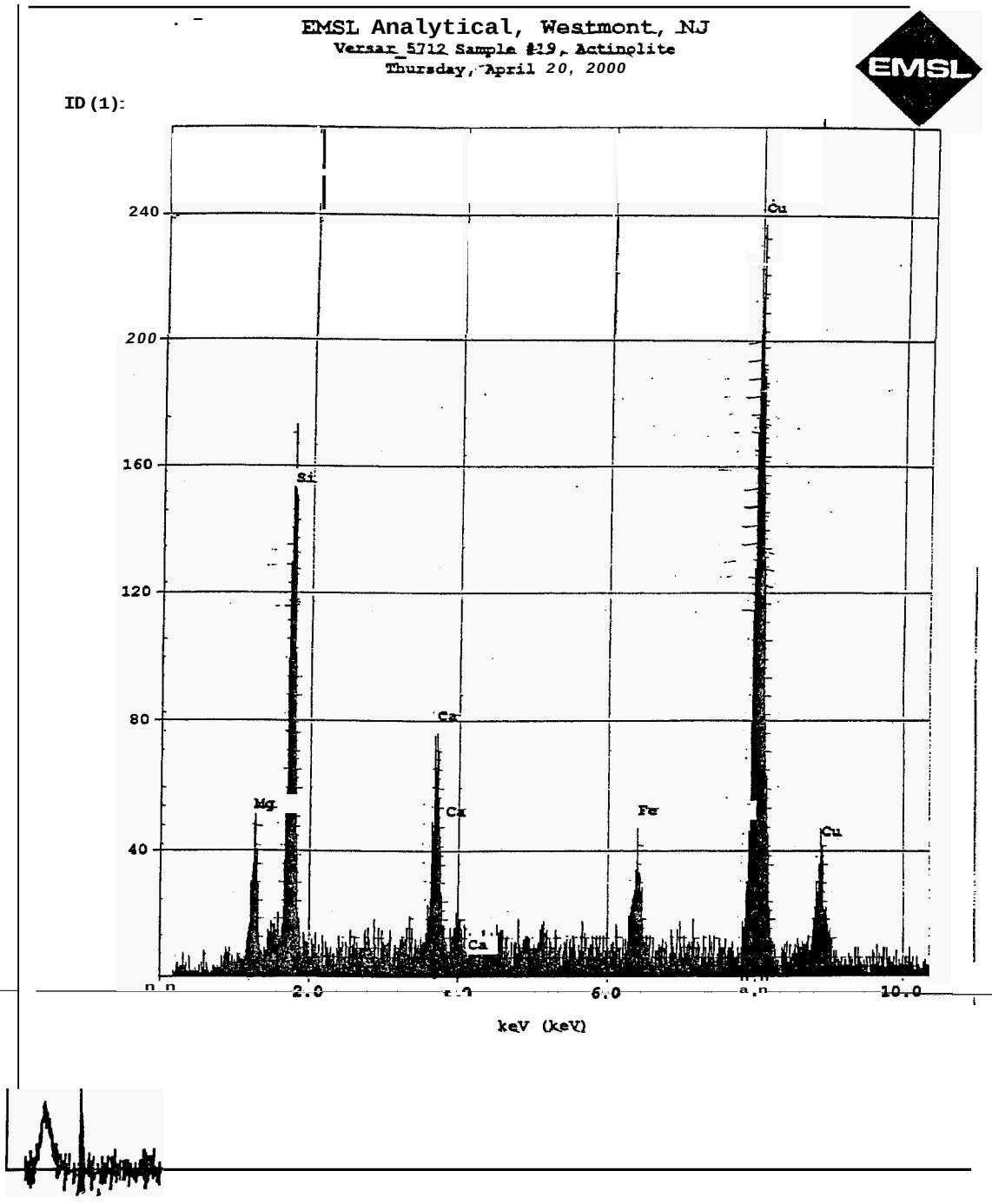


Figure 23. Energy Dispersive X-Ray Spectrum From Diopside Fiber Mis-identified as Actinolite

3.3 Simulation Studies

For the EPA Headquarters study, EPA have continued to resist releasing the laboratory analytical data sheets for the air samples analyzed by EMSL Analytical Inc. Without these data sheets, the interpretation of the analyses cannot be completed.

3.4 Overall Comments on EPA Headquarters Study

A summary of the irregularities in the EPA Headquarters study, so far as the available data permit, is shown in Figure 24.

1. EPA continues to withhold the laboratory fiber counting sheets from the simulation studies. Accordingly, no information is available as to whether the fibers counted were asbestos or cleavage fragments.

2. EPA improperly applied the Integrated Risk Information System (IRIS) to calculation of risks, when the IRIS supporting data included none for tremolite/actinolite, and none for non-asbestiform cleavage fragments. Based on the analyses of the bulk vermiculite samples, it is likely that EPA improperly assigned asbestos risk factors to non-asbestiform amphibole particles that are not asbestos.

3. EPA improperly applied a conversion factor of 30 $(\mu g/m^3)/(f/cc)$ to their study, when the conversion factor applies only to chrysotile. The conversion factor for amphibole would have been much higher.

4. In the analyses of bulk vermiculite samples, EPA ignored its own definition of asbestos as specified in EPA/600/R-93/116.

5. In the analyses of bulk vermiculite samples, EPA mis-identified diopside and hornblende particles as actinolite.

6. In the analyses of bulk vermiculite samples, EPA did not alert the reader that "asbestos" concentrations reported with two significant figure precision were in fact based on as few as one or two fibers.

Figure 24. Irregularities in the EPA Headquarters Study

EPA assigned asbestos risk factors to their air sampling data, and concluded that there was a small risk to persons handing vermiculite indoors for a few hours yearly. Extrapolation of these risks to workers who are exposed to the products occupationally gives calculated excess cancer risks of up to 1 in 640. The application of these asbestos risk factors to the fibers found in current vermiculite products is invalid, because, based on the information provided by the bulk sample analyses, the fibers in these products were not asbestos. Moreover, the data used to derive the asbestos risk factors included no data for tremolite/actinolite, and, in particular, no data from non-asbestiform amphiboles. In its calculations, EPA also used a conversion factor relating weight concentration and fiber concentration. This conversion factor was derived from chrysotile only, and is not valid for amphiboles.

4. CONCLUSIONS OF REVIEW OF REPORT EPA 744-R-00-010

With the exception of experiments performed using samples of Zonolite from Libby, Montana, the results of these EPA studies provide no scientific basis for the statement that currently available vermiculite products contain asbestos, or that use of these products present measurable cancer risks. In the interpretation of the analytical data, EPA ignored its own published definition of asbestos, mis-identified fibers, and applied risk factors that are not valid for the non-asbestiform fibers found in the vermiculite products studied. The conclusions reached by EPA on the basis of their studies are not supported by their data.